WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 203

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 203

General Information

In this report an overview is given of analytical data for this sample collected in our proficiency testing program. The consensus values are calculated using a robust statistical model. With this NDA model, the mean and standard deviation are calculated using all reported data when at least 4 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into two sections: Consensus Values and Indicative Values. The division is made on the reliability of the data. Consensus Values are based on at least 8 results and a maximum relative uncertainty of 6.25%. Indicative Values are based on a maximum relative uncertainty of 35% and a minimum of 4 and maximum of 7 results, or a relative uncertainty greater than 6.25% when there are at least 8 results.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation), the uncertainty of the mean (consensus or indicative) value and the relative uncertainty.

All values, expressed on a weight basis (kg or %), are reported as oven-dried (105°C) material. Moisture is reported in the material as received.

Sample information

WEPAL reference materials are from natural sources only. There is no spiking, mixing or other alterations of the samples. For sample preparation, the IPE samples are dried at 70°C and milled to pass a 0.5 mm sieve.

This IPE sample 203 of Cabbage (leaf + Stalk) / Brassica oleracea, from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been used in 10 periods (or rounds). Only results from the last 5 periods are used. This way, the consensus values reflect the latest 'state of the art' analytical techniques used by the laboratories. The results on which the values in this report are based were taken from the periods given in the following table:

Year	Round	Number
2023	4	4
2020	4	1
2020	3	3
2020	2	2
2020	1	4

Consensus Values IPE 203

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
B	mg/kg	49.5	4.19	8.5	357	49.6	2.51	0.277	0.560
Cu	mg/kg	2.60	0.488	18.8	404	2.63	0.297	0.030	1.17
Fe	mg/kg	66.1	6.23	9.4	424	66.3	3.60	0.378	0.572
Mn	mg/kg	65.9	4.43	6.7	437	65.9	2.79	0.265	0.402
Zn	mg/kg	51.1	3.53	6.9	440	51.2	2.17	0.210	0.411
As	µg/kg	40.1	10.2	25.4	64	41.2	6.85	1.59	3.97
Cd	µg/kg	144	21.1	14.7	121	143	13.0	2.40	1.67
Co	µg/kg	60.3	11.4	18.9	75	60.1	7.58	1.64	2.72
Cr	µg/kg	2852	429	15.1	95	2890	282	55.1	1.93
Hg	µg/kg	10.2	2.20	21.5	63	10.4	1.11	0.346	3.38
Li	µg/kg	742	171	23.0	22	717	87.5	45.5	6.14
Mo	µg/kg	15129	1478	9.8	144	15011	937	154	1.02
Pb	µg/kg	241	42.8	17.7	95	243	26.4	5.49	2.27
Ba	mg/kg	5.88	0.543	9.2	34	5.91	0.322	0.116	1.98
Sr	mg/kg	32.2	2.89	9.0	28	32.0	2.05	0.683	2.12
Rb	µg/kg	20886	1485	7.1	16	21050	955	464	2.22
Ca	g/kg	17.9	1.15	6.4	457	17.9	0.700	0.067	0.375
Cl (as Cl)	g/kg	2.09	0.296	14.2	72	2.10	0.187	0.044	2.09
K	g/kg	47.6	3.10	6.5	472	47.5	2.00	0.179	0.375
Mg	g/kg	4.70	0.274	5.8	460	4.70	0.170	0.016	0.340
N - Kjeldahl (as N)	g/kg	29.0	1.51	5.2	275	29.0	0.900	0.114	0.393
N - NO3 (as N)	mg/kg	4720	432	9.2	24	4696	275	110	2.34
Na	mg/kg	1018	88.7	8.7	283	1011	51.2	6.59	0.648
P (as P)	g/kg	4.91	0.301	6.1	470	4.90	0.178	0.017	0.353
S (as S)	g/kg	8.25	0.666	8.1	285	8.22	0.418	0.049	0.598

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
C - elementary	g/kg	413	14.8	3.6	168	413	9.72	1.43	0.347
N - elementary	g/kg	31.9	1.15	3.6	236	31.9	0.700	0.094	0.294

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	17.9	5.99	33.5	96	18.1	3.96	0.765	4.28

Consensus Values IPE 203

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
delta 13C	‰ V-PDB	-32.1	0.244	0.8	32	-32.1	0.140	0.054	0.168
delta 15N	‰ Air	1.57	0.341	21.8	31	1.54	0.190	0.076	4.89

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Crude fibre	g/kg	124	11.2	9.0	33	124	7.20	2.43	1.96
ADF-ash-free	g/kg	180	25.2	14.0	14	176	15.9	8.42	4.68
Total ash	g/kg	155	4.10	2.6	60	154	2.40	0.662	0.427
Total fat	g/kg	47.7	9.76	20.5	23	49.6	6.40	2.54	5.33

Indicative Values IPE 203

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
I	µg/kg	37.1	19.5	52.6	7	57.0	14.0	9.23	24.9
Ni	µg/kg	193	77.8	40.2	55	203	47.3	13.1	6.78
Se	µg/kg	57.9	21.7	37.5	52	63.2	15.0	3.76	6.50
Sb	µg/kg	35.2	9.92	28.2	21	37.5	5.76	2.71	7.69
Sn	µg/kg	91.3	16.9	18.5	13	94.1	10.4	5.85	6.41
Ti	mg/kg	2.19	3.04	139.3	11	2.67	2.45	1.15	52.5
V	µg/kg	23.7	8.94	37.8	19	24.4	5.34	2.56	10.8
N - NH4 (as N)	mg/kg	126	54.4	43.2	4	140	29.1	34.0	27.0
SO4 (as SO4)	g/kg	25.0	2.42	9.7	5	24.2	1.46	1.35	5.41

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	19.6	9.02	46.1	37	21.3	4.77	1.85	9.47
Si	mg/kg	133	70.0	52.6	6	155	37.3	35.7	26.8

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Si	mg/kg	221	272	123.0	14	232	136	90.8	41.1

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
NDF-ash-free	g/kg	194	38.3	19.8	13	195	25.0	13.3	6.85